CLAIMS:

1. An infrared detection apparatus for detecting an adverse atmospheric condition comprising:

a plurality of filters corresponding to different ones of a plurality of wavelengths and at least including filters that enable the adverse atmospheric condition to be detected;

an infrared array, said infrared array producing signals representative of infrared radiation reaching said array from a field of view;

radiation control means for controlling the infrared radiation received by the infrared array, the radiation control means including means for changing the filters so that said infrared array can produce wavelength signals representative of infrared radiation from each of said wavelengths corresponding to the adverse atmospheric condition to be detected, and means for enabling said infrared array to produce calibration signals for each wavelength signal;

calibration means for performing a calibration of each wavelength signal to correct for radiation from the infrared detection apparatus on the basis of at least the corresponding calibration signal to thereby produce a calibrated wavelength signal representative of radiation from the field of view; and

output means for producing an output indicative of the presence of the adverse atmospheric condition in the field of view based on the calibrated wavelength signals.

2. Apparatus as claimed in claim 1, further comprising correction means for correcting the calibrated signals for one or both of water vapour absorption and viewing angle effects.

3. Apparatus as claimed in claim 2, wherein the

correction means comprises a pre-computed look-up table (LUT).

4. Apparatus as claimed in claim 3, wherein the LUT is based on off-line detailed radiative transfer calculations which account for the effects of water vapour absorption and for viewing geometry for each of the preferred filtered infrared wavelengths.

5. Apparatus as claimed in claim 1, wherein the means for enabling said infrared array to produce calibration signals comprises a shutter having infrared emissivity which is high in each of said wavelengths.

6. Apparatus as claimed in claim 5, wherein said radiation control means controls said shutter to shut prior to each wavelength measurement to thereby enable said array to produce a calibration measurement corresponding to the wavelength measurement.

7. Apparatus as claimed in claim 1, wherein said calibration means performs said calibration on the basis of a calibration equation of the form R = a x C + b, where R is the calibration wavelength signal, C is the wavelength signal, and a and b are coefficients.

8. Apparatus as claimed in claim 7, wherein said calibration means alters pre-calibrated coefficients of the calibration equation on the basis of the calibration signal.

9. Apparatus as claimed in claim 7, wherein said calibration means calculates calibration coefficients for each filter and for each pixel of the infrared array.

10. Apparatus as claimed in claim 1, wherein said output means outputs temperature difference images derived

from at least two wavelengths.

11. Apparatus as claimed in claim 1, wherein the output indicative of the presence of the adverse atmospheric condition comprises temperature difference information for a plurality of portions of said field of view.

12. Apparatus as claimed in claim 11, wherein said output means processes said temperature difference information to determine whether an alarm condition is met and in outputs alarm data if said condition is met.

13. Apparatus as claimed in claim 12, configured to monitor said field of view for sulphur dioxide and wherein said temperature difference information is based on the temperatures $T_{8.6}$, $T_{10.0}$, $T_{11.0}$ and $T_{12.0}$ at four wavelengths, 8.6 μm, 10.0 μm, 11.0 μm and 12.0 μm for each portion of said field of view.

14. Apparatus as claimed in claim 13, wherein said output means produces temperature difference information by determining a first temperature difference $\delta T_1 = T_{8.6} - T_{10.0}$, a second temperature difference $\delta T_2 = T_{11.0} - T_{12.0}$, adding the temperature differences δT_1, δT_2 to obtain a third temperature difference δT_3, and correcting said third temperature difference for elevation to produce a fourth temperature difference δT_4.

15. Apparatus as claimed in claim 12, configured to monitor said field of view for volcanic ash and wherein said temperature difference information is based on a temperature difference between temperatures, $T_{11.0}$ and $T_{12.0}$ at wavelengths 11.0μm and 12.0μm for each portion of said field of view.

16. Apparatus as claimed in claim 15, wherein said

alarm condition is met if $\delta T_{va} = T_{11} - T_{12} > \Delta T_{B}$, where ΔT is a temperature threshold, for at least a predetermined number of portions of said field of view.

17. Apparatus as claimed in claim 12, configured to monitor said field of view for atmosphere dust and wherein said temperature difference information is based on temperatures $T_{8.6}$, T_{11} and T_{12} at three wavelengths 8.6µm, and 12.0µm.

18. Apparatus as claimed in claim 17, wherein said temperature difference information is determined for each portion by the equation $\delta T_{dust} = aT_{8.6} + bT_{11} + cT_{12}$ where a, b and c are constants.

19. A method of detecting an adverse atmospheric condition comprising:

providing a plurality of filters corresponding to different ones of a plurality of wavelengths and at least including filters that enable the adverse atmospheric condition to be detected;

providing an infrared array, said infrared array producing signals representative of infrared radiation reaching said array from a field of view;

controlling the infrared radiation received by the infrared array so that said infrared array can produce wavelength signals representative of infrared radiation from each of said wavelengths corresponding to the adverse atmospheric condition to be detected and to enable said infrared array to produce calibration signals for each wavelength signal;

performing a calibration of each wavelength signal to correct for radiation from the infrared detection apparatus on the basis of at least the corresponding calibration signal to thereby produce a calibrated wavelength signal representative of radiation from the field of view; and

producing an output indicative of the presence of the adverse atmospheric condition in the field of view based on the calibrated wavelength signals.

20. A method as claimed in claim 19, further comprising correcting the calibrated signals for one or both of water vapour absorption and viewing angle effects.

21. A method as claimed in claim 19 comprising controlling a shutter having infrared emissivity which is high in each of said wavelengths to shut prior to each wavelength measurement to thereby enable said array to produce a calibration measurement corresponding to the wavelength measurement.

22. A method as claimed in claim 19, comprising performing said calibration on the basis of a calibration equation of the form R = a x C + b, where R is the calibration wavelength signal, C is the wavelength signal, and a and b are coefficients.

23. A method as claimed in claim 22, comprising altering pre-calibrated coefficients of the calibration equation on the basis of the calibration signal.

24. A method as claimed in claim 22, comprising calculating calibration coefficients for each filter and for each pixel of the infrared array.

25. A method as claimed in claim 19, comprising outputting temperature difference images derived from at least two wavelengths.

26. A method as claimed in claim 19, wherein the output indicative of the presence of the adverse atmospheric condition comprises temperature difference information for a plurality of portions of said field of

view.

27. A method as claimed in claim 26, comprising processing said temperature difference information to determine whether an alarm condition is met and in outputs alarm data if said condition is met.

28. A method as claimed in claim 26, for monitoring said field of view for sulphur dioxide and wherein said temperature difference information is produced by determining a first temperature difference $\delta T_1 = T_{8.6} - T_{10.0}$, a second temperature difference $\delta T_2 = T_{11.0} - T_{12.0}$, and adding the temperature differences δT_1, δT_2 to obtain a third temperature difference δT_3, and correcting said third temperature difference for elevation to produce a fourth temperature difference δT_4.

29. A method as claimed in claim 26 for monitoring said field of view for volcanic ash and wherein an alarm condition is met if $\delta T_{va} = T_{11} - T_{12} > \Delta T_E$, where ΔT is a temperature threshold, for at least a predetermined number of portions of said field of view.

30. A method as claimed in claim 26 for monitoring said field of view for atmosphere dust and wherein temperature difference information is determined for each portion by the equation $\delta T_{dust} = aT_{8.6} + bT_{11} + cT_{12}$ where a, b and c are constants.